Biological Molecules Answers

1.

a	i CH2OH or CH3 ringed	1
	ii peptide bond between C and N, H and OH removed to form water; (not: condensation reaction)	2
b	folding of alpha helix / secondary structure; to give three dimensional shape (to molecule); (not: globular/complex) reference to any 2 appropriate bonds; hydrogen ionic, disulphide/ hydrophobic reactions between R groups	MAX 2
c	i biuret reagent;	
	ii pink/purple	2
d	elongated molecules/alpha helices/polypeptides; (formed into) strands (not: fibrous/fibrils)	2

2.

Award a mark for each correct row.

Feature	*Carbohydrate*	*Lipid*	*Protein*
Can be saturated or unsaturated.		✓	
Contain peptide bonds			✓
Contains the elements carbon, hydrogen and oxygen.	✓	✓	✓
Can contain disulphide bonds.			✓
Cellulose and glycogen are examples.	✓		

3.

(a) (i)	(Structural) isomers	1
(ii)	Reference to the fact that the OH and the H are reversed on carbon 1.	1
(b)	Accept any ring drawn that removes 2 H s and an O, i.e. shows the removal of water. From Carbon 1 on the alpha glucose and carbon 4 on the beta glucose.	1
(c)	Covalent / glycosidic	1
(d)	Disaccharide allow: maltose	1
(e)	Any two from the following: - Starch is made from alpha glucose molecules, or cellulose is made from beta glucose molecules. - Glucose can be added or removed easily from starch. - Cellulose is a very stable molecule due to cross-linkages between adjoining chains. - In starch, all units are the same way up, in cellulose they alternate. - Starch forms granular structures, cellulose forms fibrous structures. - Starch is branched, cellulose is not. - Starch has amylose and amylopectin. (not: ref to size / strength of bonds)	2
(f) (i)	Starch – Storage molecule (In plants) / long term energy store.	1
(ii)	Cellulose – Needed for plant cell walls.	1
	(Candidates must make it clear which molecule they are referring to if they do not mention both.)	[9]

4.

(a)	A glycerol		(1)
	B fatty acid		(1)
(b)	Ring around 2Hs and 1 O between components		(1)
(c)	Condensation		(1)
(d)	Each fatty acid joined by oxygen bridge		(1)
	Double bond to C atom of each fatty acid		(1)
(e)	(i)	Trigycerides/triacylglycerol	(1)
	(ii)	Energy (store)/respiratory water (not: storage)	(1)
(f)	(i)	Heart disease/coronary/angina	(1)
	(ii)	In olive oil fatty acids are unsaturated/have double bonds	(1)
	(iii)	Fats are solid oils are liquid (at physiological temperatures)/ reference to different melting points.	(1)

Total = 11 marks

5.

	Monosac-charide	Disac-charide	Structural Polysac-charide	Storage Polysac-charide	
Glucose is an example of	/				(1)
Cellulose is an example of			/		(1)
Amylose is an example of				/	(1)
Maltose is an example of		/			(1)
Insoluble			/	/	(1)
Deoxyribose is an example of	/				(1)
Glycogen is an example of				/	(1)

Total 7 marks

6.

(a) amino acid 1

(b) COOH/carboxyl/carboxylic 1

(c) NH_2/amino/amine 1

(d) 'R' group variable/not fixed 1

(e) (i) C – CO – NH – C
H_2O 2

(ii) Condensation 1

(iii) Peptide
(allow: dipeptide) 1

[8]

7.

(a) I 1

(b) A 1

(c) F 1

(d) E 1

(e) H 1

(f) A/F/G (Any 2) 2

[7]

8.

	Protein	*DNA*	*Disaccharide*	*Phospholipid*
Carbon + Hydrogen + Oxygen	/	/	/	/
Nitrogen + Sulphur	/	X	X	X
Disulphide bonds	/	X	X	X
Glycosidic bonds	X	X	/	X
Peptide bonds	/	X	X	X
Ester bonds	X	X	X	/

1 mark per line [6]

9.

(a) G = triose/glyceraldehydes 1
F = amylose 1
C = maltose 1
A = cellulose 1
D = alpha glucose 1

(b) Insoluble (therefore do not affect osmotic potential)/coiled or compact/ glucose easily released or easily added or broken down easily
(Any 2) 2

(c) Benedicts/boil/shows reducing sugar/brick red (precipitate)
(allow: green/yellow)
non-reducing sugar negative/stays blue in above/(heat with) acid/ neutralise/then gives positive with Benedicts
2 points for 1 mark 3
(not: hydrolyse) [10]

10.

1. (a)

organic molecule	amino acid / starch
tissue	muscle
compound	$NaHCO_3$
element	Magnesium
polymer	starch

5

(b) (i) starch and cellulose: starch alpha glucose, cellulose beta;

starch two polysaccharides, cellulose one;

Starch has 1-4 and 1-6 links, cellulose 1-4 only.

Starch has a branched structure within it, cellulose un-branched;

Amylose/starch coiled, cellulose (H) bonds/cross links between adjacent mols. 2

(max 2) (Reference to both needed)

(ii) Triglyceride and phospholipids: triglyceride three fatty acids, phospholipids two;

Phospholipid: phosphoric acid/phosphate;

Phospholipids hydrophilic (head) and hydrophobic(tail) (Max 2) 2

(Comparison needed, except last point)

[9]

11.

(a) (i) D 1

(ii) B 1

(iii) A 1

(iv) F 1

(v) C 1

(vi) E 1

(Letters only; more than one answer, no mark)

(b) (i) condensation 1

(ii) water (allow correct formula) 1

[8]

12.

(a) (i) Positive end, negative end/ unequal distribution of charge; 1

Hydrogen +ve, oxygen –ve; 1

(ii) diagram of H linked to O of adjacent water. 1

(b) (i) used for transport (in blood/phloem)/chemical reactions occur in solution/allows gaseous exchange (reference to organisms needed). 1

(ii) Used for cooling body (sweating) 1

(iii) Stops large fluctuations in temperature of water, helps aquatic organisms/organisms large percentage water therefore prevents large temperature fluctuations. 1

(iv) prevents heat loss, insulating layer/allows organisms to live below it. 1

(v) light can pass through, aquatic organisms can photosynthesise. 1

[8]

13.

(i)

	Triglyceride	**Phospholipid**
Structural difference 1	3 fatty acids	2 fatty acids
Structural difference 2	(Glycerol head only)	Glycerol + phosphate head (not: phosphorus)
Where compound is found in organisms	Under skin/subcutaneous/ blubber Around body organs Fur/feathers Nerve cells Smooth ER/golgi/vesicles seeds chloroplasts	Cell/plasma **membranes**

(not: hydrophilic/hydrophobic/polar/non-polar/fat unqualified)

One mark per row = 3

(ii) Stearic/Saturated has more H or converse.

Stearic has no double bonds (in **hydrocarbon chain**/double **C-C** bonds) or converse.

Stearic acid is a straight hydrocarbon chain/not kinked/bent or converse.

1

(iii) Stearic acid/saturated (fatty acid). 1

Total 5 marks

14.

(a)	Dipeptide		1 mark
(b)	(i)	Arrow to H --C—N-- O	1 mark
	(ii)	Hydrolysis	1 mark
(c)	Different R groups (not: side groups)		1 mark
(d)	Circle 20		1 mark
(e)	(i)	α-helix	1 mark
	(ii)	Hydrogen bonds	1 mark

Total 7 marks

15.

			Available
(a)	(i)	peptide;	1
	(ii)	A = hydrogen bonds; B = disulphide bridge; C = ionic bonds;	3
(b)	(i)	alpha helix;	1
	(ii)	hydrogen bonds;	1
	(iii)	beta pleated sheet;	1
(c)		tertiary;	1
(d)	(i)	beta; glucose;	2
	(ii)	glycosidic bond; between carbon 1 and 4; condensation reaction; removal of a molecule of water;	2 Max
	(iii)	long/parallel chains; interconnection between chains; forms fibres/microfibrils; strong; (not: insoluble)	2 Max

[14]

16.

(a)	(i)	Hexose	1 mark
	(ii)	Maltose	1 mark
	(iii)	Water	1 mark
	(iv)	1 and 4	1 mark
(b)	(i)	The positions of -OH and -H are reversed on C1	1 mark
	(ii)	Structurally different molecules with the same general formula.	1 mark
(c)	ß-glucose		1 mark
(d)	Long chains strengthened by cross linkages/microfibrils.		1 mark
(e)	Cellulose cell walls confer strength/rigidity/structural support.		1 mark

Total 9 marks

17.

amylose;
alpha/α;
glycosidic;
water/H_2O;
beta/β;
hydrogen/H;
microfibrils; [7]

18.

(a) (i) Glycerol (allow : triglyceride) (1)

(ii) The elimination of water/condensation reaction. (1)

(iii) A long chain (16+) of hydrocarbon atoms/long chain of CH_2 or CH groups/hydrophobic. (1)

(b) (i) R in fat is saturated/no double bonds between carbons

R in oil is unsaturated/has double bonds. (1)
Comparison needed

(ii) Storage of energy. (not just storage)

(iii) Lipid yields twice as much energy as the same weight of carbohydrate. (or equivalent) (1)
(not : ref to insoluble and effects on water potential)

(c) (i) Replacement of one fatty acid with a phosphate group. (1)

(ii) C is polar/partially water soluble/hydrophilic (any two)

whereas B is not. (1)

(iii) It forms the plasma membrane / phospholipid bilayer (1)

by enabling the orientation (of the phopholipid bilayer) (1)
(not : reference to movements in and out).

Total 11

19.

(a) (i) glycerol;

3 fatty acids
(labels required) [max 2]

(ii) ester [1]

(iii) phospholipid has phosphoric acid;

phospholipid 2 fatty acids;

phospholipid hydrophobic tails and hydrophilic head/polar molecule;
[max 2]

(b) fats have higher energy value (animal will not be as heavy if

storing same energy values as carbohydrate.) [1]
(not: ref. other functions/more efficient)

(c) saturated more hydrogen;
Saturated solid at room temperature and unsaturated are liquid;
unsaturated double bonds and saturated single/no double bonds;
unsaturated kinky/bent tails and saturated straight.
[max 2]

(d) (i) make contents of tubes alkaline/raise pH [1]
(not: ref. optimum pH)

(ii) red (allow: green)

(iii) lipase/enzyme hydrolyses/splits fats;

fatty acids make contents acidic/lowering pH [2]

(iv) (heating has) changed shape of active sites;
(not: destroy)
denatured enzyme/ bonds broken;
substrate no longer fits/complementary/ no enzyme-substrate complex forms.
no fatty acids produced [2]
(not: ref. product/no digestion)

20.

(a) (i) Showing, 1 O and 2 H s removed.

Elimination of water, stated.

Molecules joined by oxygen bridge. [3]

(ii) Maltose (not: disaccharide). [1]

(iii) Water. [1]

(iv) Condensation. [1]

(b) (i) Joining together sub units / monomers /repeating units/ residues
(to make a larger molecule) [1]
(not: joining molecules into a chain/ specific example)

21.

(a) β glucose [1]

(b) glycosidic [1]

(c) starch has α glucose molecules cellulose has β glucose;

starch two polysaccharides (or named), cellulose one;

starch has (two polysaccharides) one of which is branched whereas cellulose is unbranched;

starch has 1-4 and 1-6 linkages, cellulose 1-4 only;

amylose / starch coiled, cellulose (cross linked) in straight chains;

starch consists of single chains cellulose has many parallel chains linked with hydrogen bonds.

Starch, glucose all same way 'up', rotated (90°) in cellulose.

(must be a comparison) [Any 2] [2]

(d) long chains cross linked by hydrogen bonds;

adjacent glucose molecules are rotated by 180°;

hydrogen bonds form between hydroxyl groups of adjacent parallel chains;

microfibrils. [2]

(not: fibres/fibrils) [Any 2]

[Total 6 marks]

22.

2. (a)

Level of protein structure	Types of bonds			
	peptide	hydrogen	disulphide	ionic
Primary	/			
Secondary	/	/		
Tertiary	/	/	/	/

[1 mark per row across] [3]

(b) (i) More than one polypeptide chain present /

two or more polypeptide chains present. [1]
(not: ref. to protein/tertiary)

(ii) haemoglobin / collagen / insulin/antibodies [1]

[Total 5 marks]

23.

(a) F / calcium or G / phosphate

(b) I / sucrose

(c) A / magnesium

(d) D / cellulose

(e) G / phosphate

(f) H / water
(mark first answer) [1 mark each] **[Total 6 marks]**

24.

(a) (i) nitrogen containing part; [1]

(ii) arrow pointing to glycosidic bond; [1]

(iii) hydrolysis; [1]

(iv) hydroxyl groups point outwards;

link with neighbouring chains;

via hydrogen bonding;

to form microfibrils;

strong structure because of large number of hydrogen bonds;

chains associate in groups / fibres formed;

beta glucose units. [3 max]
ref. alternating rotation

25.

(a)

(ii) Polypeptide chains; (not: proteins)
Three chains; (not: strands)
(Three) alpha helices;
Tightly/closely bound;
Held together by hydrogen bonds: (3 max)

(iii) Structural/relevant example e.g. tendons or named tissue strengthened.
(not: strength or name of tissue unqual./tensile strength) 1

(b) (i) Four chains vs. three;
Iron/prosthetic/haem group vs. none;
Compact vs. non-compact/long fibres vs spherical;
3 polypeptide chains the same vs 2 different polypeptide chains;
Secondary structure vs. quaternary structure: (not: more complex) (3 max)

(ii) Hormones/enzyme/ antibodies/plasma proteins. (not: specific examples) 1

9 MARKS

26.

(a) Mitochondrion. 1

(b) (i) Advantage: 2
*Higher energy yield per unit mass/higher yield per g.
Disadvantage:
More oxygen required for respiration.

(ii) Heat/thermal/electrical insulation; (not: insulation unqual.) (2 max)
*Better source of metabolic water;
Buoyancy;
Protection against knocks (not: protection unqual.)
(points marked * are interchangeable and could be credited in either (i) or (ii) but not credited in both)

(c) (i) New tissue manufacture/growth qualified/repair; 2
Enzyme manufacture.

(ii) Breaking a bond; (not: molecule broken down) 2
Insertion of a molecule of water/chemical addition of water
(not: adding water)

(iii) Glucose; (not: beta glucose) 2
Amino acids.

11 MARKS

27.

needed for / found in / used in /component of chlorophyll;
(allow: middle lamella / enzyme co-factors)
component haemoglobin; enzyme Co factors
component nucleic acids/DNA/RNA/ATP/ (plasma) membrane/ phospholipids/
hardens bone / nucleotide;
hardens/deposited in bones/teeth/ossification/synaptic transmission
enzyme co-factors/middle lamella (not: strengthen bones) **[4]**

28.

cell wall;
beta/β;
glycosidic;
180;
hydrogen;
microfibrils; (not: microfibres) **[6]**

29.

(a) (i) glycerol;
(3) fatty acids; **[2]**

(ii) ester; **[1]**
hydrolysis;
chemical insertion of water/water added to bond **[2]**

(iii) energy storage / respiratory substrate/source of energy
waxy cuticle/leaf waterproofing;
membrane structure; **[2]**

(Total 7 Marks)

30.

(a) (i) amino acid;
triglyceride; (not: lipid/triglycerol) **2**

(ii) nitrogen/sulphur; (not: chemical symbols) **1**

(b) condensation;
peptide; **2**

(c) (i) add Biuret to test solution; (not: if ref. to boiling) **1**
blue changing to mauve/purple colour is positive result; **1**

(ii) little colour change/mauve colour may be masked; **1**

(Total 8 marks)

31.

(a)		nitrogen (not: N)	1
(b)	(i)	heat/boil with {Benedict's/ Fehlings A + B} solution; NOT boil	1
		with acid	1
		colour change from blue to {green/yellow/orange/brick red/ brown}	
	(ii)	A	1
(c)		C	1
(d)	(i)	D	1
	(ii)	saturated- no double bonds/ all carbon atoms have/attached to two hydrogens ;	1
		Fewer hydrogen atoms (or converse)	1
		Must have comparison for each	

(Total 8 marks)

32.

(a) (i)	hydrogen/H		1
(ii)	{Holds/binds} {cellulose/glucose} {chains/molecules} together/ forms microfibrils;		1
	strengthens (the wall)/ (cellulose fibres are) strong/ rigid/ gives structural stability/ can resist turgor/ osmotic pressure/ prevents plant cells bursting.		1
(b) (i)	condensation/ polymerisation		1
(ii)	(Has) amino acid (added)/glucosamine (to form a mucopolysaccharide)/ amine/ NH_2		1
(iii)	(exo)skeleton – strong/waterproof/ light/ rigidity/ tough NOT exoskeleton gives protection		1
(c) (i)	glycogen		1
(ii)	starch (accept amylose/ amylopectin)		1

(Total 8 marks)

33.

(a) (i) α glucose OH on C1 down, H up + β glucose OH on C1 up, H down; 1

Allow HO (both for 1 mark).

(b) (i) Cellulose –Beta Starch – alpha; (both for 1 mark). 1

Allow symbols.

(ii) Starch: **any 2** 2

correct reference to amylose and/or amylopectin;

glycosidic bonds (α 1-4);

molecules coil/branch (in amylopectin); NOT compact

NOT: amylopectin – coiled or amylase branched

easy to add/remove {glucose / maltose} units;

Cellulose: **any 2** 2

alternate units rotate / head up, head down / 180° rotation;

straight chain only / no branches; NOT parallel

hydrogen bonds between / reference to cross linking;

gives strength or stability / forming microfibrils;

Question total **6**

34.

(a) (i) OH and H removal shown on diagram; 3

formation of water (H_2O) shown;

dipeptide correctly drawn with C joined to N;

(ii) Condensation; 1

(iii) Peptide; NOT dipeptide; 1

35.

(a)		Quaternary/ 4°;	1
(b)	(i)	(Labelled) arrow in correct position;	1
	(ii)	COOH/ carboxyl/ carboxylic acid;	1
	(iii)	Disulphide {bond/ bridges} / ionic bonds / hydrogen / hydrophobic interactions / Van der Waals; (Any 2) NOT peptide / S-S (covalent – neutral)	1

36.

(a)	(i)	Molecule of water (drawn with arrow towards the O atom of the glycosidic bond); NOT water going out Monosaccharides drawn with –OH groups in correct position on C1 and C4 (involved in bond);	2
	(ii)	Hydrolysis; NOT hydrolysation (ignore reference to acid)	1
	(iii)	Glycosidic;	1
	(iv)	Glucose <u>and</u> galactose; ignore alpha/ beta	1

37.

(a)	(i)	A <u>amino/amine</u> ; B <u>carboxyl</u>;	2
	(ii)	variable group/side chain OR description of; NOT element/ hydrocarbon chain/ R group	1
(b)	(i)	Dipeptide; NOT polypeptide	1
	(ii)	peptide (bond);	1
(c)	(i)	hydrogen bonds; NOT H bond	1
	(ii)	**Alpha/ α** helix; NOT double helix	1
	(iii)	secondary/ 2° (structure) NOT second	1
		Question 1 total	**[8]**

38.

(a)	(i)	Ester;	1
	(ii)	Hydrolysis;	1
	(iii)	Glycerol and fatty acid drawn correctly; Glycerol and fatty acid named;	2
	(iv)	Glycerol and fatty acids have different structures / OWTTE; (not just reference to monomers)	1
(b)	(i)	(Oleic acid is) unsaturated; It contains at least one C=C double bond (in the hydrocarbon chain) / is not fully saturated with hydrogen (atoms); NOT hydrogen bonds/ fewer hydrogens	2
	(ii)	Any 2 protection of internal organs against impact; thermal insulation; buoyancy; waterproofing skin/fur; source of metabolic water;	Max 2
		Question 3 total	**[9]**

Essay Mark schemes starting on the next page…

Essays
1.

A carbohydrates consist of C, H and O only/ C(H2O)n/equivalent;

B single unit is monosaccharide;

C e.g. glucose;

D different numbers of carbons + e.g;

E can exist in linear or ring form;

F basic diagram of glucose/hexose ring;

G structural isomerism or equivalent;

H e.g. alpha & beta glucose, simple description or diagram

I joined by glycosidic bands

J e.g. 1-4 or 1-6;

K by condensation to form disaccharides;
K2 example of disaccharide

L many monomers/longer chains are polysaccharides;

M description of starch or glycogen;

N description of cellulose;

2.

(a)

A	Primary is (type, number and) sequence/order of amino acids	(1)
B	linked by peptide bonds	(1)
C	Secondary is (3D) folding/most common is (α) helix/ β pleated sheet	(1)
D	formed by hydrogen bonds (between peptide bonds)	(1)
E	Tertiary is folding/twisting of a α helix/structure	(1)
F	(As shown by) globular proteins	(1)
G	To form very specific (3D) shapes	(1)
H	R groups project from α helix/side chains/part of active site (i.e. function of R groups)	(1)
I	And may react to form *bonds* which stabilise 3D shape (i.e. side chains)	(1)
J, K	Any two from, covalent/disulphide bridges; ionic/salt bridges; hydrogen bonds; hydrophobic bonds.	(1)
L	Quaternary is two or more polypeptide/amino acid chains. (not: protein)	(1)
M	Joined by similar bonds between projecting R groups. (i.e. named bond between R groups)	(1)
N	e.g. Haemoglobin.	(1)
O	Fibrous proteins have helices linked in strands.	(1)

(Maximum 10 from available 15)

Total = 10 marks

3.

A. Primary structure, sequence of amino acids;

B. Linked by peptide bonds;

C. Secondary structure described;

D. Hydrogen bonds / ionic bonds;

E. Tertiary structure described;

F. As shown by globular proteins;

G. Disulphide bridges / covalent;

H. Ionic, salt bridges, hydrogen, hydrophobic bonds, Van der Waals; (Any 2)

I. Quaternary structure described;
(reference to polypeptide chains, not proteins)

J. Enzymes with an example;

K. Antibodies or hormones;

L. Connective tissue/keratin is a resistant protein in skin cells - helps prevent entry of pathogens/structural or fibrous/muscle;

M. AVP Carrier molecules in active transport/facilitated diffusion;

N/O Any two from:

AVP Secondary source of energy;

AVP Albumin - water potential;

AVP Transport of oxygen-haemoglobin;

AVP Histones;

AVP Fibrinogen - blood clotting;

AVP Allow one other function if described.

6 marks for structure 4 for function. [10]

4.

(a) [10]

A primary, secondary, tertiary and quaternary;
B primary is number/ sequence of amino acids;
C linked by peptide bonds;
D secondary is alpha helix;
E beta pleated sheet;
F linked by hydrogen bonds;
G fibrous protein;
H tertiary is folding of chains;
I-J disulphide bridges
ionic bonds
hydrophobic bonds;
K between R groups;
L forming specific/3D shape/globular;
M named example/enzyme;
N quaternary is linking of two or more polypeptide chains;
O e.g. haemoglobin/chlorophyll;

5.

Water

A. Polar molecule / dipolar;
B. Explanation of dipole, H +ve, O –ve;
C. Hydrogen bonding explained;
D. Importance surface tension eg walk on surface;
E. Gases dissolve so available for aquatic organisms for respiration/photosynthesis;
F. Universal solvent / dissolves polar and ionic substances or examples (not: many substances dissolve in water);
G. Importance in transport of materials in blood or phloem/xylem;
H. High latent heat of vaporisation;
I. Explanation of importance, cooling body when sweating;
J. High thermal capacity/specific heat;
K. Explanation significance eg heats up slowly and cools down slowly;
L. Importance of this in ability to maintain a constant temperature;
M. Transparent so light passes through for photosynthesis;
N. Ref. cohesion-tension theory and transpiration;
O. Because less water mols per unit volume ice less dense and rises to surface/floats on top of water;
P. Insulates preventing further heat loss eg hibernation in ponds/walking on surface;
Q. Water a reactant eg in Photosynthesis/hydrolysis

6.

(b)

A water is a polar molecule / dipolar / allows chemical reactions to to take place in solution; [1]

B explanation of dipolar H +ve, O –ve (allows diagram); [1]

C explanation of hydrogen bonding; [1]

D water is an universal solvent / dissolves polar and ionic substances or examples (**not:** many substances dissolve in water); [1]

E since chemicals dissolve in water it acts as a transport medium in blood or phloem / xylem; [1]

F water molecules show cohesion qual. / tall columns of water can be drawn up xylem vessels in tall trees / reference to cohesion tension theory and transpiration/ surface tension-importance to living organisms e.g. walk on surface [1]

G gases such as O_2 and CO_2 dissolve in water, available for respiration / photosynthesis; [1]

H high latent heat of vaporisation; [1]

I explanation of importance, cooling body when sweating;

J water has a high specific heat / large amount of heat energy is needed to raise the temperature of water / high thermal capacity; [1]

K explanation – heats up slowly and cools down slowly; [1]

L importance of this ability to maintain constant temperature / this prevents large fluctuations in the temperature of water / important in keeping the temperature of aquatic habitats stable / that organisms do not have to endure extremes of temperature; [1]

M water is transparent allowing light to pass through enabling aquatic plants to photosynthesise effectively; [1]

O Water in its solid form (ice) is less dense than water and so floats on the surface; [1]

P Ice forms an insulating layer and allows organisms to survive beneath it / preventing further heat loss / hibernation in ponds [1]

Q Water is a reactant in photosynthesis / hydrolysis

[Total 10 marks]

7.

A.	Energy storage;	[1]
B.	Release more energy per unit mass than carbohydrates;	[1]
C.	Makes seeds lighter / smaller for dispersal / energy store for hibernation;	[1]
D.	Phospholipid component of cell membrane;	[1]
E.	Controls entry of molecules into cell;	[1]
F.	Insulation;	[1]
G.	Protection of (delicate) organs or e.g.;	[1]
H.	Buoyancy for aquatic animals or e.g.;	[1]
I .	consist of the elements carbon hydrogen and oxygen;	[1]
J .	Glycerol plus three fatty acids;	[1]
K.	Joined by condensation reactions;	[1]
L.	Via ester bonds;	[1]
M.	saturated and unsaturated fatty acids;	[1]
N.	phosphate group present in phospholipids	[1]
O.	water proofing+ wax/oils;hormones+ steroids; myelin sheath + insulation; AVP	

Any 5 structure i.e. points B, D, E, I to N and 5 others

[Total 10 marks]

8.

A Both contain the elements CHON;

B Both can link to form larger molecules/polymers/ref. monomers;

C Nucleotides consist of nitrogenous base;

D plus pentose and phosphate; (not: 5C sugar)

E bases are pyrimidines and purines;

F Amino acids possess an amine/NH_2 group/carboxylic group;

G Variable R group;

H More/20 types of amino acid;

I Amino acids link together by peptide bond formation/sugar phosphate backbone;

J Five different bases in nucleotides/5 named; (not: letters only)

K Bases can undergo complementary base pairing;

L Adenine with thymine or uracil and guanine with cytosine;

M By hydrogen bonds;

N Nucleotides carry genetic information;

O Sulphur containing vs. phosphate containing.

10 MARKS

9.

A primary structure, {sequence/ order} of amino acids in its polypeptide chain

B linked by peptide bonds

C secondary structure consists of – α helix/ pleated sheet

D hydrogen bonds

E tertiary structure described - 3D folding/ irregular/ further folding

F as shown by globular proteins

G disulphide bridges/ ionic/ hydrogen/ hydrophobic (any two)

H Quaternary structure described- combination of two or more polypeptide chains

I Some proteins have non-protein groups/ prosthetic groups

J enzymes – function or description of

K antibodies/hormones/ plasmaproteins with function

L haemoglobin – {carries/ transport} of oxygen

M fibrous proteins + example connective tissue/ keratin/ collagen

N Function of fibrous protein - strength

O carriers in active transport/ facilitated diffusion /fibrinogen in blood clotting /histones/ ribosomal proteins

(Any 10 out of 15 points)

10.

A. Monosaccharides / single sugars plus 2 suitable examples;
B. Diagram of hexose/glucose;
C. Alpha and beta forms of glucose shown; (can be description)
D. Pentoses/deoxyribose/ribose and presence in DNA/RNA;
E. Trioses in photosynthesis/respiration/metabolic pathways;
F. Disaccharides plus 2 suitable examples;
G. Correct formation of glycosidic bond (stated or diagrams, labelled);
H. 2 suitable examples of where disaccharides are found (milk sugar/germinating seeds/transport in plant stems);
I. Starch in plant cells for storage of glucose; NOT energy
J. Correct reference to starch structure (alpha glucose/amylose & amylopectin/1 -4 and 1 – 6 linkages/amylose spiral chain/amylopectin branched);
K. Glycogen in animal cells for glucose storage ;
L. Glycogen has branched chains;
M. Cellulose in plant cell walls/structural polysaccharide;
N. Correct reference to cellulose structure (beta glucose/microfibrils/ chains held together by H – bonds/alternate 180° glucose);
O. Correct reference to chitin (amino groups/ use in {exoskeleton/ fungal cell walls})

11.

A	polysaccharides {are polymers/ formed during condensation reactions};	10 max
B	(monomers are) joined by glycosidic bonds;	
C	starch is made up from alpha glucose;	
D	starch is composed of amylose and amylopectin / contains both 1,4 & 1,6 bonds;	
E	glycogen is made from (alpha) glucose;	
F	{Starch/glycogen} are insoluble and therefore osmotically inert/ OWTTE;	
G	{Starch/glycogen} are storage molecules because {glucose can be added or removed easily / they have a compact structure};	
H	cellulose is composed of beta glucose;	
I	alternate glucose molecules are rotated by 180°/ head up head down structure;	
J	this form long straight chains (of beta glucose)/ only contains 1-4 bonds;	
K	{hydrogen bonds / cross links} form between the chains;	
L	forming microfibrils;	
M	cellulose provides {strength/rigidity} to plant cell walls / cellulose prevents osmotic lysis in plant cells;	
N	in chitin some OH groups are replaced with amino acids / amine groups / glucose amine;	
O	chitin provides strength to fungal cell walls / (arthropod) exoskeletons;	